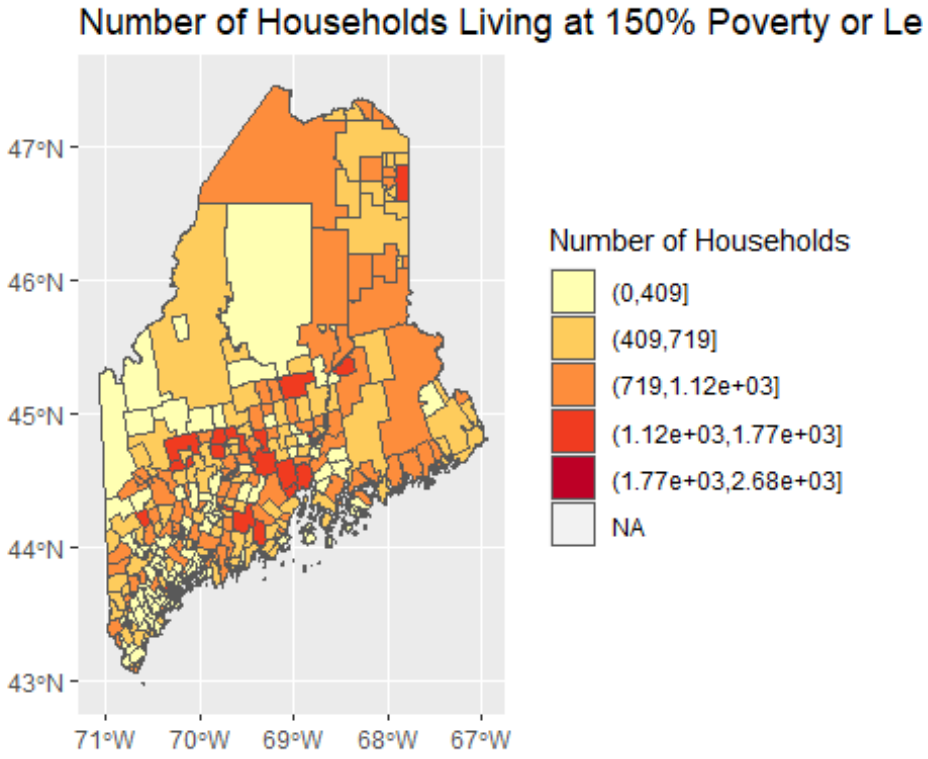
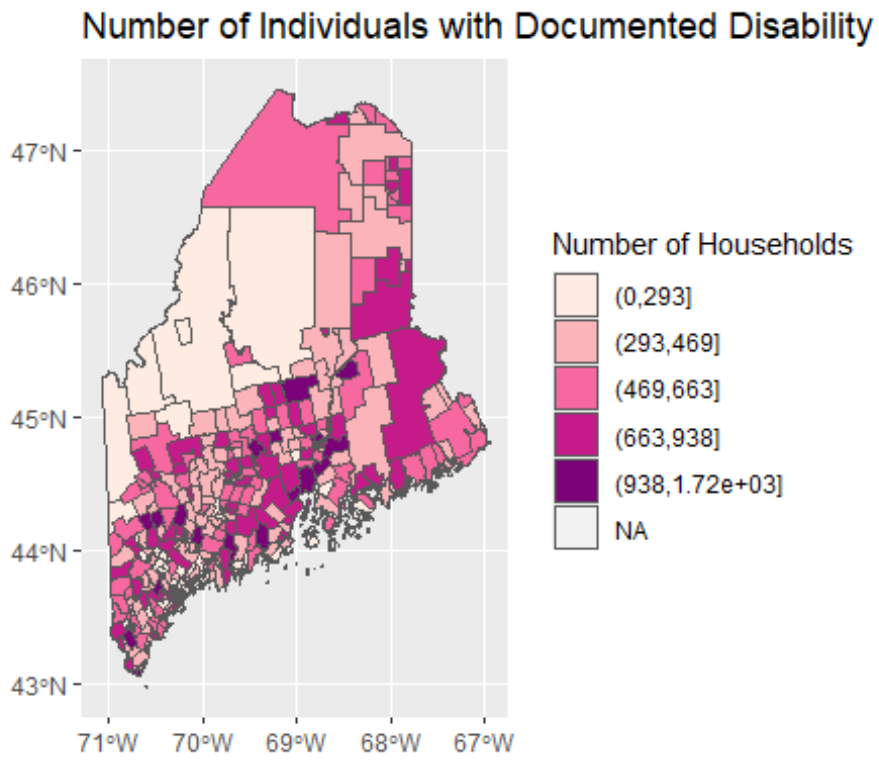
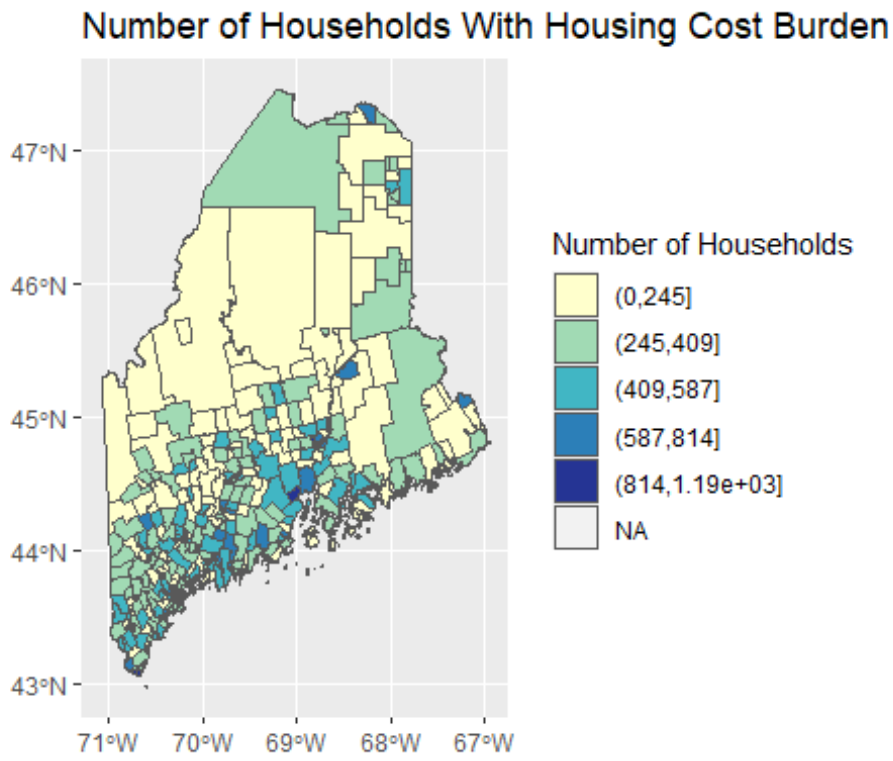
```
brks=classIntervals(mainesv$E_POV150, n=5, style="jenks", intervalClosure = '
left')
mainesv$pov <- cut(mainesv$E_POV150, brks$brks)

ggplot()  +
  geom_sf(data = mainesv, aes(fill = pov)) +
  scale_fill_brewer(palette = "YlOrRd") +
  coord_sf() +labs(title ="Number of Households Living at 150% Poverty or Les
s", size=1, fill="Number of Households")
```




```
brks=classIntervals(mainesv$E_DISABL, n=5, style="jenks", intervalClosure = '
left')
mainesv$nohs <- cut(mainesv$E_DISABL, brks$brks)

ggplot()  +
  geom_sf(data = mainesv, aes(fill = nohs)) +
  scale_fill_brewer(palette = "RdPu") +
  coord_sf() +labs(title ="Number of Individuals with Documented Disability",
size=1, fill="Number of Households")
```

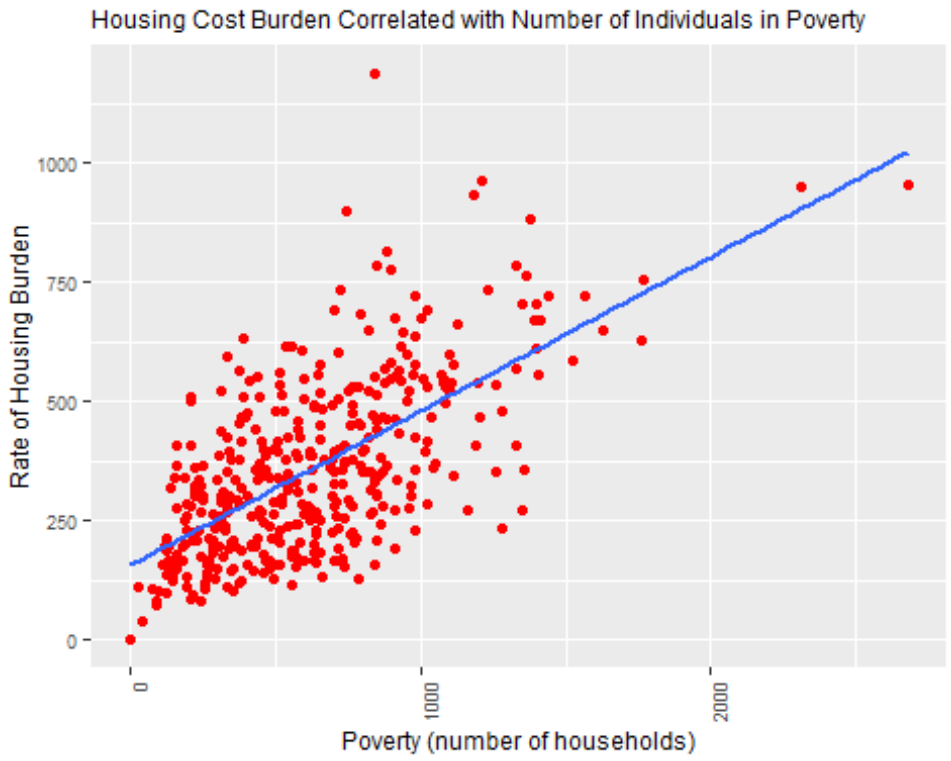



```
brks=classIntervals(mainesv$E_HBURD, n=5, style="jenks", intervalClosure = 'l
eft')
mainesv$hburd <- cut(mainesv$E_HBURD, brks$brks)

ggplot()  +
  geom_sf(data = mainesv, aes(fill = hburd)) +
  scale_fill_brewer(palette = "YlGnBu") +
  coord_sf() +labs(title ="Number of Households With Housing Cost Burden", si
ze=1, fill="Number of Households")
```



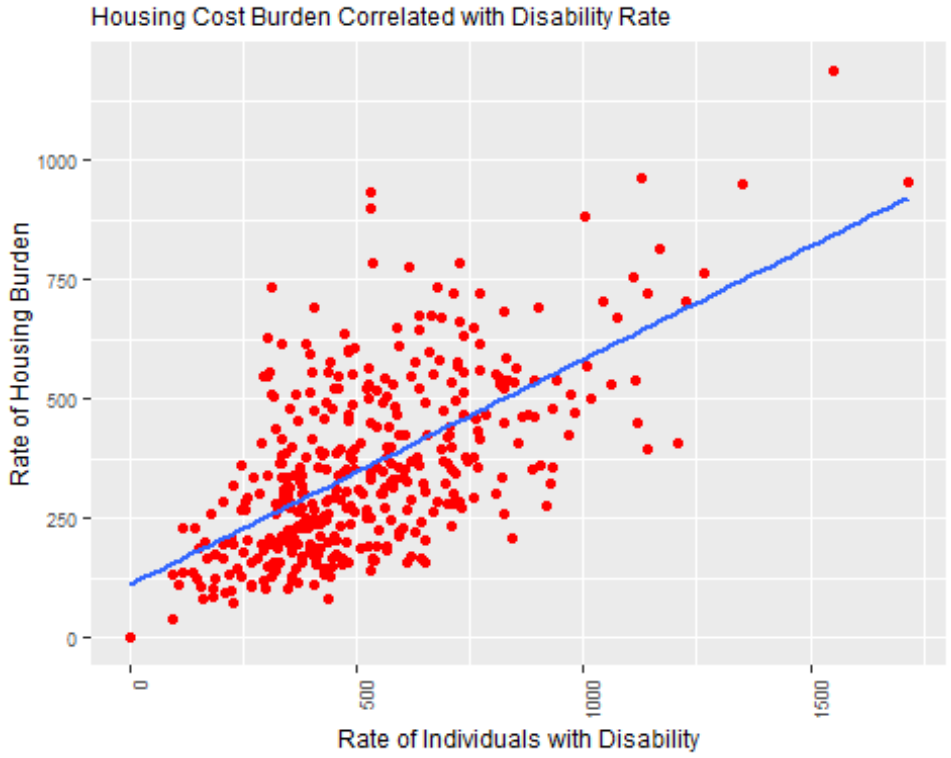

```
ggplot(data = mainesv, aes(x = E_POV150, y=E_HBURD)) + geom_point(col='red')+
geom_smooth(method=lm, se=FALSE)+ labs(title ="Housing Cost Burden Correlated
with Number of Individuals in Poverty", x = "Poverty (number of households)",
y = "Rate of Housing Burden")+ theme(plot.title = element_text(size=9),  axis
.text.x=element_text(angle=90, hjust=1, size = 7), axis.title.x =element_text
(size =9), axis.text.y=element_text(hjust=1, size = 7), axis.title.y =element
_text(size =9))
```

```
## `geom_smooth()` using formula 'y ~ x'
```



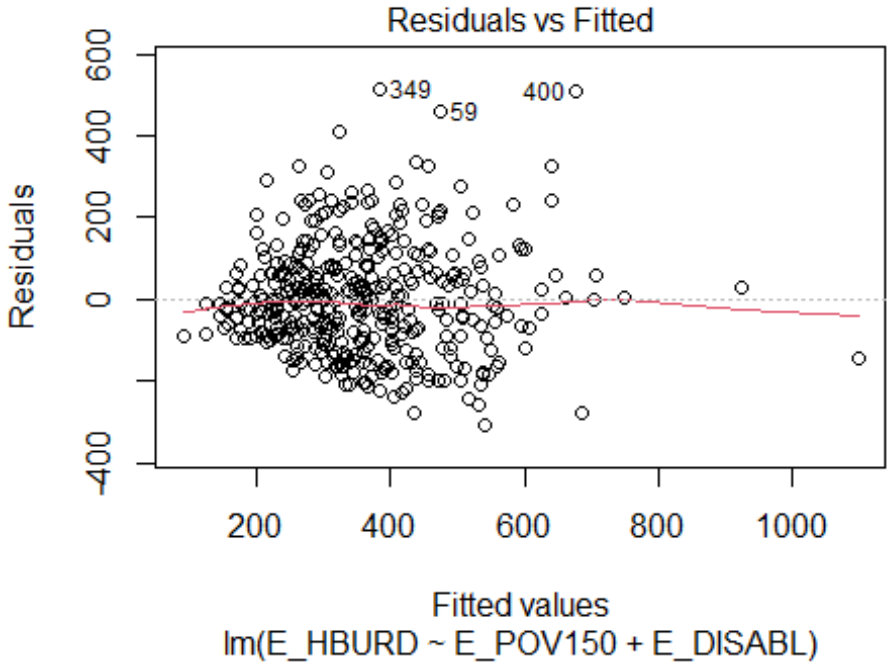

```
lmpov <- lm(E_HBURD  ~ E_POV150, data=mainesv)
summary(lmpov)

##
## Call:
## lm(formula = E_HBURD ~ E_POV150, data = mainesv)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -334.69 -101.79  -16.68   86.20  758.97
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 155.69773   14.16576   10.99   <2e-16 ***
## E_POV150      0.32344    0.01956   16.53   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 142.8 on 399 degrees of freedom
## Multiple R-squared:  0.4066, Adjusted R-squared:  0.4051
## F-statistic: 273.4 on 1 and 399 DF,  p-value: < 2.2e-16

ggplot(data = mainesv, aes(x = E_DISABL, y=E_HBURD)) + geom_point(col='red')+
geom_smooth(method=lm, se=FALSE)+ labs(title ="Housing Cost Burden Correlated
with Disability Rate", x = "Rate of Individuals with Disability", y = "Rate o
f Housing Burden")+ theme(plot.title = element_text(size=9),  axis.text.x=ele
ment_text(angle=90, hjust=1, size = 7), axis.title.x =element_text(size =9),
```

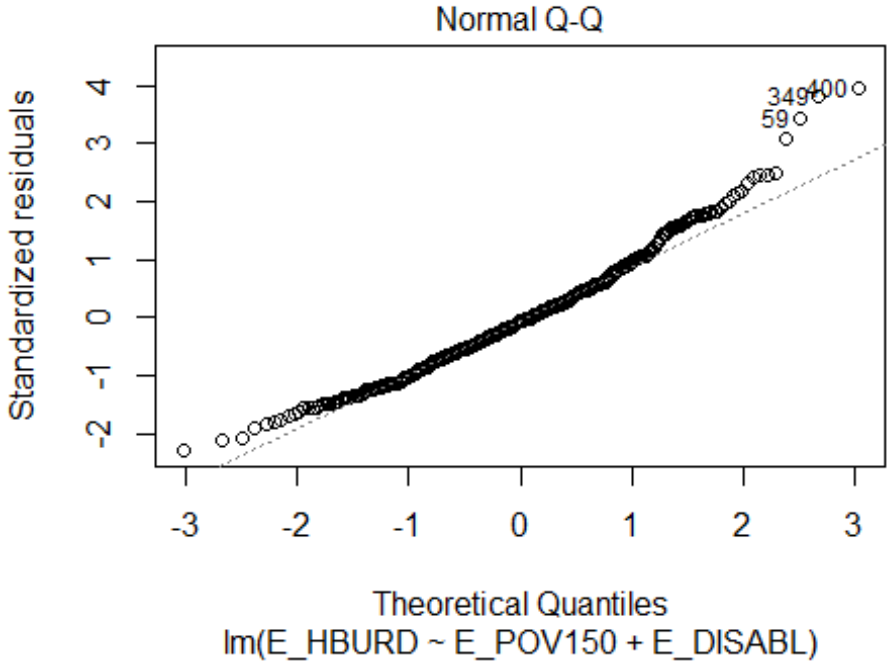
```
axis.text.y=element_text(hjust=1, size = 7), axis.title.y =element_text(size
=9))

## `geom_smooth()` using formula 'y ~ x'
```

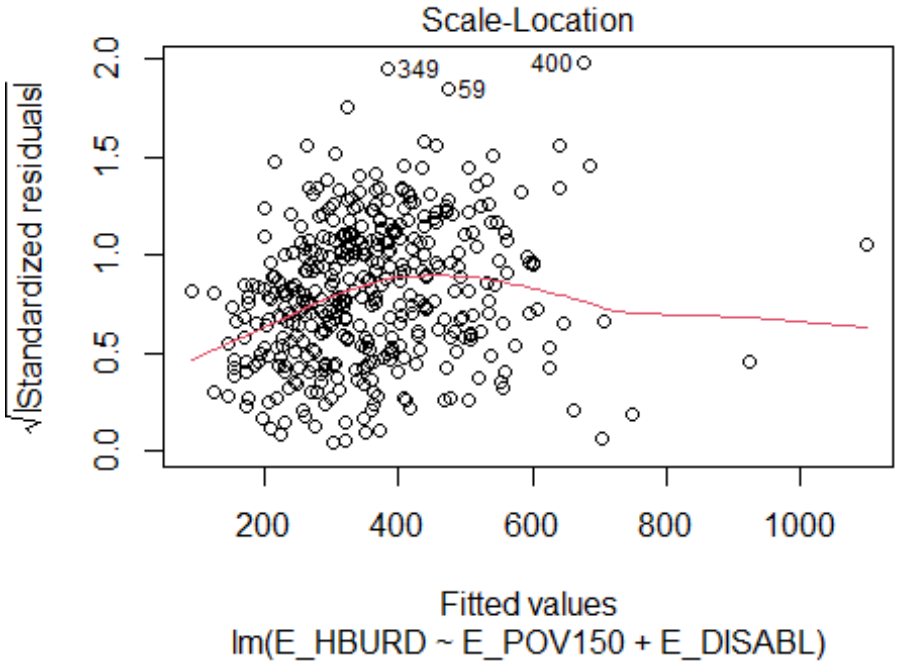


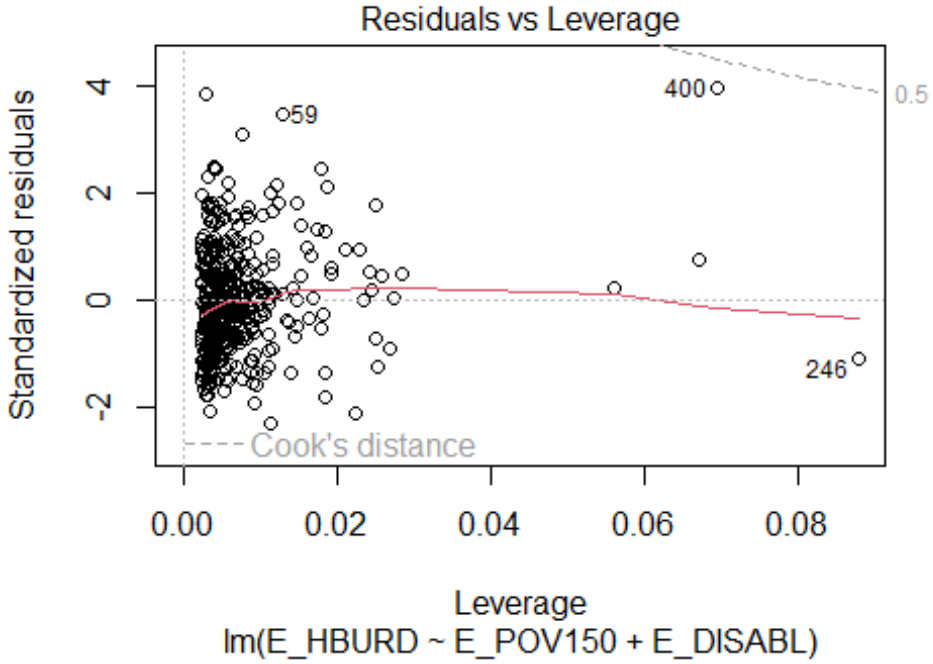

```
lmnohs <- lm(E_HBURD  ~ E_DISABL, data=mainesv)
summary(lmnohs)

##
## Call:
## lm(formula = E_HBURD ~ E_DISABL, data = mainesv)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -301.34 -102.44  -28.51   76.29  573.96
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 110.66502   17.32856   6.386 4.73e-10 ***
## E_DISABL      0.47230    0.03002  15.730  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 145.6 on 399 degrees of freedom
## Multiple R-squared:  0.3828, Adjusted R-squared:  0.3812
## F-statistic: 247.4 on 1 and 399 DF,  p-value: < 2.2e-16
```

```
ols <- lm(E_HBURD  ~ E_POV150+E_DISABL, data=mainesv)
plot(ols)
```










```
coef(ols)

## (Intercept)    E_POV150    E_DISABL
##  90.0448517   0.2056088   0.2660604
```

```
summary(ols)

##
## Call:
## lm(formula = E_HBURD ~ E_POV150 + E_DISABL, data = mainesv)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -306.59  -91.91   -9.34   76.63  513.76
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 90.04485   16.20638   5.556 5.06e-08 ***
## E_POV150     0.20561    0.02473   8.313 1.49e-15 ***
## E_DISABL     0.26606    0.03722   7.148 4.24e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 134.6 on 398 degrees of freedom
## Multiple R-squared:  0.4741, Adjusted R-squared:  0.4715
## F-statistic: 179.4 on 2 and 398 DF,  p-value: < 2.2e-16

bptest(ols)

##
##  studentized Breusch-Pagan test
##
## data:  ols
## BP = 16.872, df = 2, p-value = 0.0002169

jarque.bera.test(ols$residuals)

##
##  Jarque Bera Test
##
## data:  ols$residuals
## X-squared = 36.587, df = 2, p-value = 1.135e-08

nbscali=poly2nb(mainesv, queen = TRUE)
W <- nb2listw(nbscali, style = "W", zero.policy=TRUE)

lm.morantest(ols, W, zero.policy=TRUE)

##
##  Global Moran I for regression residuals
##
## data:
## model: lm(formula = E_HBURD ~ E_POV150 + E_DISABL, data = mainesv)
## weights: W
##
## Moran I statistic standard deviate = 13.078, p-value < 2.2e-16
```

```
## alternative hypothesis: greater
## sample estimates:
## Observed Moran I      Expectation         Variance
##     0.4052065868    -0.0032494078     0.0009754505

moran.test(ols$residuals, W, randomisation = FALSE, zero.policy=TRUE)

##
##  Moran I test under normality
##
## data:  ols$residuals
## weights: W  n reduced by no-neighbour observations
##
##
## Moran I statistic standard deviate = 13.028, p-value < 2.2e-16
## alternative hypothesis: greater
## sample estimates:
## Moran I statistic       Expectation          Variance
##      0.4052065868     -0.0025125628      0.0009794059

moran.test(ols$residuals, W, randomisation = TRUE, zero.policy=TRUE)

##
##  Moran I test under randomisation
##
## data:  ols$residuals
## weights: W  n reduced by no-neighbour observations
##
##
## Moran I statistic standard deviate = 13.04, p-value < 2.2e-16
## alternative hypothesis: greater
## sample estimates:
## Moran I statistic       Expectation          Variance
##      0.4052065868     -0.0025125628      0.0009775584

moran.mc(ols$residuals, W, 99, zero.policy=TRUE)

##
##  Monte-Carlo simulation of Moran I
##
## data:  ols$residuals
## weights: W
## number of simulations + 1: 100
##
## statistic = 0.40521, observed rank = 100, p-value = 0.01
## alternative hypothesis: greater

moran.test(ols$residuals, W, randomisation = FALSE, zero.policy = TRUE)

##
##  Moran I test under normality
##
```

```
## data:  ols$residuals
## weights: W  n reduced by no-neighbour observations
##
##
## Moran I statistic standard deviate = 13.028, p-value < 2.2e-16
## alternative hypothesis: greater
## sample estimates:
## Moran I statistic       Expectation          Variance
##      0.4052065868     -0.0025125628      0.0009794059
```

```
logLik(ols)
```

```
## 'log Lik.' -2533.202 (df=4)
```

```
BIC(ols)
```

```
## [1] 5090.38
```

```
lmtests=lm.LMtests(ols, W, zero.policy = T, test='all')
lstat=unlist(c(lmtests$LMerr[1],lmtests$LMlag[1], lmtests$RLMerr[1],lmtests$R
LMlag[1], lmtests$SARMA[1]))
pval=(c(lmtests$LMerr[3],lmtests$LMlag[3], lmtests$RLMerr[3],lmtests$RLMlag[3
], lmtests$SARMA[3]))
```

```
summary(lmtests)
```

```
##  Lagrange multiplier diagnostics for spatial dependence
## data:
## model: lm(formula = E_HBURD ~ E_POV150 + E_DISABL, data = mainesv)
## weights: W
##
##        statistic parameter   p.value
## LMerr    166.997         1 < 2.2e-16 ***
## LMlag     62.357         1 2.887e-15 ***
## RLMerr   116.640         1 < 2.2e-16 ***
## RLMlag    12.001         1 0.0005317 ***
## SARMA    178.998         2 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
serror<- errorsarlm(E_HBURD ~ E_POV150 + E_DISABL, data = mainesv, listw=W, z
ero.policy = T)
summary(serror)
```

```
##
## Call:errorsarlm(formula = E_HBURD ~ E_POV150 + E_DISABL, data = mainesv,
##     listw = W, zero.policy = T)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -345.139  -67.405  -12.635   56.047  443.534
##
```

```
## Type: error
## Regions with no neighbours included:
##  162 343
## Coefficients: (asymptotic standard errors)
##              Estimate Std. Error z value  Pr(>|z|)
## (Intercept) 65.113054  17.937467  3.6300 0.0002834
## E_POV150     0.237907   0.021707 10.9599 < 2.2e-16
## E_DISABL     0.279476   0.031521  8.8663 < 2.2e-16
##
## Lambda: 0.56285, LR test value: 108.78, p-value: < 2.22e-16
## Asymptotic standard error: 0.053446
##     z-value: 10.531, p-value: < 2.22e-16
## Wald statistic: 110.91, p-value: < 2.22e-16
##
## Log likelihood: -2478.812 for error model
## ML residual variance (sigma squared): 12766, (sigma: 112.99)
## Number of observations: 401
## Number of parameters estimated: 5
## AIC: 4967.6, (AIC for lm: 5074.4)
```

```
slag<- lagsarlm(E_HBURD ~ E_POV150 + E_DISABL, data = mainesv, listw=W, zero.
policy = T)
summary(slag)
```

```
##
## Call:lagsarlm(formula = E_HBURD ~ E_POV150 + E_DISABL, data = mainesv,
##     listw = W, zero.policy = T)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -300.152  -85.296  -15.787   71.345  503.094
##
## Type: lag
## Regions with no neighbours included:
##  162 343
## Coefficients: (asymptotic standard errors)
##               Estimate Std. Error z value  Pr(>|z|)
## (Intercept) -38.500599  20.416091 -1.8858   0.05932
## E_POV150      0.196379   0.023175  8.4736 < 2.2e-16
## E_DISABL      0.266364   0.034358  7.7527 9.104e-15
##
## Rho: 0.37376, LR test value: 51.403, p-value: 7.524e-13
## Asymptotic standard error: 0.048814
##     z-value: 7.6567, p-value: 1.9096e-14
## Wald statistic: 58.625, p-value: 1.9096e-14
##
## Log likelihood: -2507.501 for lag model
## ML residual variance (sigma squared): 15367, (sigma: 123.96)
## Number of observations: 401
## Number of parameters estimated: 5
```

```
## AIC: 5025, (AIC for lm: 5074.4)
## LM test for residual autocorrelation
## test value: 43.172, p-value: 5.0146e-11

p <- c(AIC(ols), AIC(slag), AIC(serror))
q <- c(BIC(ols), BIC(slag), BIC(serror))
r <- c(logLik(ols), logLik(slag), logLik(serror))

labdata <- data.frame(p,q,r)
names(labdata) <- c("AIC", "BIC", "Log Likelihood")
rownames(labdata) <-c("OLS Model", "Spatial Lag Model", "Spatial Error Model"
)
print(labdata)

##                           AIC      BIC Log Likelihood
## OLS Model           5074.404 5090.380      -2533.202
## Spatial Lag Model   5025.002 5044.972      -2507.501
## Spatial Error Model 4967.624 4987.594      -2478.812

summary(labdata)

##       AIC            BIC       Log Likelihood
##  Min.   :4968   Min.   :4988   Min.   :-2533
##  1st Qu.:4996   1st Qu.:5016   1st Qu.:-2520
##  Median :5025   Median :5045   Median :-2508
##  Mean   :5022   Mean   :5041   Mean   :-2507
##  3rd Qu.:5050   3rd Qu.:5068   3rd Qu.:-2493
##  Max.   :5074   Max.   :5090   Max.   :-2479
```